

tion to the orifice, so that the inner throat of the shell at some little distance down appears almost closed.

Three specimens, of which two are in good condition.

We take this opportunity of correcting two errors that have appeared. In our paper in Ann. & Mag. Nat. Hist. for Sept. 1891 the dimensions of *Cyclostoma transvaalense* should have been long. 12, lat. $11\frac{1}{2}$ mill. In the same paper it will be noticed that there is a discrepancy between the number of teeth in *Vertigo thaumasta* as stated in the Latin and the English text. The former is correct, for it will be seen on reference to the plate that the shell has *three* teeth.

EXPLANATION OF THE PLATES.

PLATE IV.

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| Fig. 1. <i>Helix viridescens</i> †. | Fig. 7. <i>Helix lygæa</i> . |
| Fig. 2. — <i>rhyodes</i> . | Fig. 8. — <i>hypochlora</i> . |
| Fig. 3. — <i>epetrima</i> . | Fig. 9. — <i>trichosteiroma</i> . |
| Fig. 4. — <i>Crawfordi</i> *. | Fig. 10. — <i>gypsina</i> †. |
| Fig. 5. — <i>pretoriensis</i> *. | Fig. 11. — <i>porphyrostoma</i> †. |
| Fig. 6. — <i>hottentota</i> †. | Fig. 12. — <i>namaquensis</i> †. |

PLATE V.

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| Fig. 1. <i>Helix liricostata</i> †. | Fig. 8. <i>Vitrina cingulata</i> *. |
| Fig. 2. — <i>dioryx</i> . | Fig. 9. — <i>zonamydra</i> *. |
| Fig. 3. — <i>erateina</i> . | Fig. 10. <i>Buliminus quisqualis</i> . |
| Fig. 4. — <i>bathycale</i> . | Fig. 11. — <i>Layardi</i> . |
| Fig. 5. — <i>tuguriolum</i> . | Fig. 12. — <i>lamocensis</i> . |
| Fig. 6. <i>Cyclostoma transvaalense</i> †. | Fig. 13. <i>Pupa elizabethensis</i> . |
| Fig. 7. <i>Pisidium Langleyanum</i> †. | |

PLATE VI.

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|---------------------------------------|-------------------------------------|
| Fig. 1. <i>Cionella ovampoensis</i> . | Fig. 7. <i>Vertigo thaumasta</i> †. |
| Fig. 2. <i>Stenogyra cacuminata</i> . | Fig. 8. <i>Ennea scrobiculata</i> . |
| Fig. 3. — <i>Chapmani</i> . | Fig. 9. — <i>Bowkere</i> . |
| Fig. 4. <i>Ennea thelodonta</i> . | Fig. 10. — <i>aperostoma</i> . |
| Fig. 5. — <i>munita</i> . | Fig. 11. <i>Pupa ovampoensis</i> . |
| Fig. 6. — <i>dolichoskia</i> . | Fig. 12. <i>Ennea Marie</i> . |

* Described in the 'Annals' for Dec. 1890.

† Ditto for Sept. 1891.

XV.—On the Skeleton of a Chimæroid Fish (*Ischyodus*) from the Oxford Clay of Christian Malford, Wiltshire. By A. SMITH WOODWARD, F.G.S.

OF the later Jurassic Chimæroid fishes several skeletons have been discovered in a good state of preservation in the Bavarian Lithographic Stone (Lower Kimmeridgian)*. In

* *Ischyodus avitus*: *Chimæra* (*Ganodus*) *avita*, H. von Meyer, Palæontogr. vol. x. (1862), p. 87, pl. xii.—*Ischyodus Quenstedti*, A. Wagner, Abh.

Britain, however, such fossils have hitherto remained unknown, and Chimæroid fishes have been recorded solely on the evidence of detached teeth and spines. At last a single specimen, comparable in many respects with the Bavarian material, is forthcoming for discussion; and this forms the subject of the following notes. The writer observed the fossil during a recent visit to the Northampton Museum, and is indebted to the kindness of Mr. T. J. George, F.G.S., Curator, and the Committee of the Museum, for the opportunity of making a detailed study of the characters of the specimen.

The fossil is displayed on a small slab of hard clay from the Oxfordian series of Christian Malford, near Chippenham, Wiltshire, and was evidently obtained from the same horizon as that already well known to yield species of *Lepidotus*, *Aspidorhynchus*, and *Leptolepis**. The skeleton is apparently that of a laterally-compressed fish, being shown in side-view; and the cartilages seem to have been very slightly calcified. The total length of the original fish probably did not exceed 0·32 m., and its maximum depth would be about 0·045.

The rostrum is unfortunately wanting and the cartilages of the head are too much crushed and obscured for determination. Moreover the dentition is too imperfectly displayed to decide whether the species is truly referable to *Ischyodus* or to *Ganodus*; but as the latter genus has never been obtained above the Lower Oolites, the specimen may be most probably assigned to *Ischyodus*. The left palatine and vomerine dental plates are shown from the external aspect, the latter of the quadrate shape characterizing these plates in *Ischyodus*. The greater part of the left mandibular plate is also exposed from the outer face, showing the deeply sinuous oral border; and the corresponding element on the right side projects in front, showing the very narrow symphysis. The individual being a male, a large rostral spine occurs on the top of the head, with a cluster of scattered dermal hooklets below. The base of this spine forms a triangular expansion, with a faint median crest on the inferior attached face; and the proximal

math.-phys. Cl. k. bay. Akad. Wiss. vol. ix. (1862), p. 286, pl. i. fig. 1, and J. Riess, Palæontogr. vol. xxxiv. (1887), p. 6, pl. i. figs. 1-5, pl. ii. figs. 1-7.—*Chimæropsis paradoxa*, K. A. von Zittel, Handb. Palæont. vol. iii. (1887), p. 114, fig. 126, and J. Riess, *loc. cit.* p. 21, pl. ii. figs. 9-11, pl. iii. figs. 1-10.

* Sir P. Egerton, "On some new Species of Fossil Fish from the Oxford Clay at Christian Malford," Quart. Journ. Geol. Soc. vol. i. (1845), pp. 229-232.

end of the comparatively slender exerted portion is laterally compressed, though apparently expanding again at the distal end, where it is much broken. The denticles originally clustered upon this spine are very slender, pointed, sigmoidally bent, and fixed upon expanded bases.

The vertebral column consists, as usual, of a closely arranged series of delicate calcified rings, of which five in the abdominal region occupy a length of 0·0035 and measure 0·004 in vertical diameter.

Of the appendicular skeleton both the pectoral and pelvic arches are too imperfectly preserved for description; but the elongated claspers are faintly shown, and these do not appear to have been provided with dermal hooklets or spines. A single denticle resting upon the pelvic cartilage may well have been displaced from the group on the head.

The dorsal fin-spine, which measures 0·057 in length, is remarkably slender and only slightly arched. The small supporting cartilage is conspicuous at its base. In form and proportions, and even in the restricted anterior area of the superficial striations, it agrees precisely with the small spines from the Stonesfield Slate described as *Leptacanthus semi-striatus**, and, if found at a Lower Oolitic horizon, would be thus named without hesitation. In Elasmobranch and Chimæroid fishes, however, the characters of the dorsal fin-spines are often unreliable and insufficient for specific, or even generic, determinations.

No traces of calcified rings in the "lateral line" system or of dermal tubercles are exhibited; but the absence at least of the former is probably due to their loss in the extrication of the fossil from the matrix.

In conclusion, the Oxfordian fossil now described tends further to confirm the reference of the *Ischyodus*-like fishes to the existing family of Chimæridæ, and a peculiar form of "*Leptacanthus*," already assumed on theoretical grounds to pertain to *Ganodus* †, is definitely proved to be at least Chimæroid. The impossibility of observing the oral surface of the dental plates prevents, as already remarked, any satisfactory determination; but the external aspect of the dentition so closely resembles that of the well-known Upper-Jurassic species *Ischyodus Egertoni* ‡ that, until further evidence is discovered, the Christian Malford fossil may be provisionally quoted as an immature example of that form.

* L. Agassiz, Rech. Poiss. Foss. vol. iii. (1837), p. 28, pl. vii. figs. 3-8.

† Woodward and Sherborn, Cat. Brit. Foss. Vertebrata (1890), p. 114.

‡ L. Agassiz, *tom. cit.* p. 340, pl. xl. c. figs. 1-10.